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INSTITUTE OF GAS TECHNOLOGY

THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY

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GAS ABSTRACTS

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1. GAS INDUSTRY

Education

Dotterweich, F. H. SPECIALIZED ENGINEERS FOR THE NATURAL GAS INDUSTRY. *Am. Gas J.*, 177, 21-22 (1952) September.

Texas College of Arts and Industries and Pennsylvania State College now offer accredited undergraduate programs in the combined fields of petroleum and natural gas engineering. Texas A. and I. has also initiated graduate work leading to the master's degree.

Abstracters note: The natural gas industry is the nation's sixth largest industry. However, very little has been done to train men at the college level for careers in the industry. The gas industry has grown faster than its supply of men for supervisory and administrative positions. In employing engineering graduates, companies are required to provide costly and time consuming periods of cadet training. Southern gas companies are working closely with Prof. Dotterweich at Texas A. and I. to provide college level academic training for the natural gas industry. Also, gas companies from the entire United States established the Institute of Gas Technology 11 years ago as a unique center of research, education and information devoted exclusively to gas industry problems. Manufactured gas as well as natural gas is covered. Graduate fellowships are available at IGT to assist worthy students financially in graduate level training at the master's and doctoral levels in the technology of the gas industry.

J. D. Parent

Fuel Economy Plan

Minister of Fuel and Power. REPORT OF THE COMMITTEE ON NATIONAL POLICY FOR THE USE OF FUEL AND POWER RESOURCES 242 pp. (H.M.S.O.) (1952) September: *Gas J.* (British) **271**, 626-631 (1952) September 17; *Gas World* (British) **136**, 633-641, 642 (1952) September 13; *Gas Times* (British) **72**, 349-354, 367 (1952) September 19.

The Committee on National Policy for the Use of Fuel and Power Resources, was appointed July 1951 by the Minister of Fuel and Power. The Committee was charged to consider any possible further steps to promote the best use of fuel and power resources, and it assumed that the aims of a national policy of best use should (1) meet fully the demands for the different services, when sold at prices corresponding to costs, (2) provide export fuels of types and amounts most profitable to the country, (3) promote maximum economic efficiency of use, (4) encourage the services of the fuel giving best returns. Because of shortages, present supplies must be properly shared and in spite of planned expansions in all fuels, this condition will continue for some years. Problems of pricing, improved efficiency and coordinated use will require much work by a Joint Planning Board of representatives of the nationalized fuel and power industries. Problems and recommendations are abstracted in some detail.

O. P. Brysch

Gas:Oil Future

FORECAST FOR PETROCHEMICALS. *Oil Gas J.*, 51, 102-105 (1952) September 1.

A long range nation-wide survey of the trends and requirements of the petrochemical industry for the period 1955 to 1975 has been prepared by Standard Oil Development Co. for the President's "Paley Report". End-uses are estimated for synthetic rubbers and fibers, plastics, detergents, organic chemicals, fertilizers and a variety of other products. It is estimated that 6 billion pounds of natural gas will be used for petrochemical manufacture in 1955, with the 1975 figure at 14 billion pounds. It is thought that the 1975 figure will represent only 2.3% of the total consumption. (see Gas Abs. 8, 164 (1952) August).

J. D. Parent

Gas Prices

Smith, N. L. A NEW APPROACH TO THE PRICING OF GAS. *Gas*, 28, 117-118 (1952) September.

In the recent FPC opinion No. 228 involving minimum well-head price fixing, the commission decided that although the Supreme Court upheld the principle of minimum well-head prices in the interest of conservation a state commission could not circumvent the jurisdiction of FPC and disallowed the well-head minimum as a cost of service to be used as a basis

for rate fixing. The author expressed the opinion that reexamination should be made of the conventional approach to pricing.

J. D. Parent

Growth of Regulation

Smith, N. L. PUBLIC UTILITY REGULATION. *Am. Gas J.*, 177, 23-26 (1952) September.

This article, by a Commissioner of the Federal Power Commission, briefly reviews the history of utility regulation and the gradual expansion of the powers of regulatory commissions. A. E. Neumann

Industry Development

Newcomb, M. DON'T FETTER THE GROWING GIANT. *Am. Gas Assoc. Monthly*, 34, 8-11, 42-45 (1952) September.

This article, an abridged version of an address intended primarily for a Texas audience, emphasizes that vigorous free enterprise has promoted the natural gas industry's growth nationally despite encompassing regulations. However, the author cautions: "there must be a limit to the natural gas reserves which will ultimately be available; and at some point there should be a restraint upon the construction of new facilities or additional facilities for the exportation of gas from the producing states."

A. E. Neumann

Rate Making

Scraag, H. A. A RESTATEMENT OF FUNDAMENTALS OF UTILITY RATE MAKING. *Public Utilities Fortn.*, 50, 347-354 (1952) September 11.

A proper charge for a service by a public utility is based on the cost of providing the service. Costs to the utility include direct costs of operation such as labor and material; taxes; depreciation and annual return. Direct costs and taxes depend on expenditures. Depreciation is based on the annual cost of capital. In this time of inflation direct costs of operation and cost of replacement are increasing. Some industries are not unduly affected since prices can be raised, but regulated enterprises are not so fortunate as immediate adjustments in charges are not possible. Lessened earning power means inadequate returns on utility investments and inability to attract new capital. Much new capital has been invested in the gas industry in recent years, but primarily as debt financing, which may indicate inability to sell equity on reasonable terms. Rates then must be adjusted to be fair to consumers and investors alike. J. D. Parent

SEC and Section 30

Cook, D. C. SEC PLANS UNDER SECTION 30 OF THE HOLDING COMPANY ACT. *Public Utilities Fortn.*, 50, 333-346 (1952) September 11.

Sections 11 and 30 of the Public Utility Holding Co. Act are discussed, particularly section 30. Section 11 directed the SEC to reduce uneconomical holding company systems to integrated systems, while 30 directed the commission to report on possible combinations which could be made in the interest of economy. Section 30 was designed to promote reorganization and simplification of holding companies and 11 was designed to eliminate unnecessary holding companies, for divestment of properties not geographically integrated into the system and assurance of equitable voting power. Lowering of cost to the public and more economical usage of power resources are the principal objectives. The work under section 11 is now largely done, and section 30 will assume more prominence in the future. J. D. Parent

2. APPLIANCES

Gas Burners

Brumbaugh, I. V. GAS BURNER WITH VERTICALLY SPACED PORTS AND INTERIOR BAFFLE. U.S. 2,609,871 (1952) September 9.

A gas conversion burner for coal furnaces and boilers is described. E. F. Searight

Wheelock, C. M. GAS BURNER WITH SECONDARY AIR FEED. U.S. 2,610,676 (1952) September 16.

A gas burner with special provision for secondary aeration is described. E. F. Searight

Wright, R. C. (assigned to Iron Fireman Manufacturing Co.) GAS BURNER. U.S. 2,609,-866 (1952) September 9.

A new gas burner for use with LP-gases for residential heating is described. E. F. Searight

House Heating

Carroll, A. L. NEW YORK FIELD TESTS SHOW THE GREATER EFFICIENCY OF GAS OVER OIL. *Gas Heat*, 3, 33, 34, 42 (1952) August.

The report covers the fuel usage for an entire heating season of 51 oil-heated residences in Westchester County (a suburb of New York City), and 56 gas-heated residences. Corrections were made for variations in house construction, insulation, temperature and other factors to arrive at a common factual relationship between the two fuels as they are found in the field. Tests were based on manufactured gas of 537 Btu, but all results are reported in therms (100,000 Btu.). Author's Abstract

Hazel, C. S. WHAT PHILADELPHIA GAS WORKS HAS EXPERIENCED IN 12 YEARS OF HOUSE HEATING SERVICE. *Gas Age*, 110, 25-28 (1952) July 3.

In view of a jump in saturation from one to 17 percent in twelve years, the Philadelphia Gas Works customer relations program with emphasis on quality equipment and installation along with a well planned program to promote summer use of heater pilots has resulted in satisfaction and economy for the customer and the utility. R. A. Brown

McCrory, W. E. SPACE HEATER WITH MEANS TO PREHEAT FUEL THEREFOR. U.S. 2,608,967 (1952) September 2.

This patent suggests a method for preheating fuel to a gas space-heater. E. F. Searight

3. COMBUSTION AND INDUSTRIAL FURNACES

Flame Electrode

Kaehni, W. L. and Kaehni, F. J. (assigned to Metal Carbides Corp.) METHOD AND APPARATUS FOR CONTROLLING THE GENERATION AND APPLICATION OF HEAT. U.S. 2,604,936 (1952) July 29.

A method of controlling the generation and application of heat by the use of a unidirectional, high potential electric current is claimed. This is done by utilizing the flame or heated media as one of the electrodes and the surface to be heated or an adjacent member as the other electrode. Greater heat generation, improvement of combustion, and control over direction of flame are claimed. R. A. Brown

Ore Reduction

Totzek, F. (assigned to Koppers Company, Inc.) METHOD AND APPARATUS FOR THE PRODUCTION OF IRON. U.S. 2,605,180 (1952) July 29.

Improved operation of blast furnaces using oxygenated blast of above 30% O_2 content is obtained by adding carbon monoxide (or other reducing gas) through the tuyéres the latter being specially designed to mix the injected gases. An enlargement of the high-temperature reaction zone in the hearth is claimed, and this is further ensured by use of more tuyéres spaced more closely. O. P. Brysch

Stuart A. T. PROCESS FOR THE REDUCTION OF METAL OXIDES BY GASES. U.S. 2,609,288 (1952) September 2.

A process for the reduction of metal oxides without fusion which comprises the steps of feeding oxide ore to a furnace having superimposed preheating, reduction and cooling zones, preheating and effecting reduction of the ore by alternate cycles of gas circulation, the first cycle comprising the circulation of a hot gas through the reduction and preheating zones, the second cycle being a reducing cycle wherein hot reducing gas is circulated only through the reducing zone, withdrawing the gases from the furnace, repeating the reducing cycle until the ore is reduced, removing the reduced metal from the furnace, extracting heat and impurities from the withdrawn gases, and heating the gases to be used in new cycles of circulation by means of the extracted heat. O. P. Brysch

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Walker, P. L. HYDROCARBON BURNING VELOCITIES. p. 219

THE INDUSTRIAL MARKET. (PROPANE). p. 213

4. CARBONIZATION AND GASIFICATION

Coal Cleaning

Crentz, W. L. and Miller, J. W. PREPARATION CHARACTERISTICS OF COAL FROM PIKE COUNTY, KY. U.S. Bureau of Mines Report of Investigations 4910, (1952) September.

Preparation data are reported on samples from 31 mines in 14 coal beds in Pike County, eastern Kentucky, in the eighth report of this series. Despite high sulfur content, the beds containing the principal reserves generally will yield satisfactory metallurgical-grade washed coal. Of the 8,199,793 tons produced in 1949, 1,375,821 tons were cleaned in 8 plants. O. P. Brysch

Needham, L. W. THE CLEANING OF SMALL COAL-I. *Gas World* (British), **136**, Coking Section, 26-29 (1952) August 2.

Small coal (below 1/2-inch in size) which is of most interest to coke-oven operators has become a more difficult problem because of increased fineness and dirt content. Improved jig, dense medium and trough washer equipment is being slowly introduced. Methods of checking the accuracy of separation of clean coal and refuse by the use of curves of ash distribution in sink and float are treated.
O. P. Brysch

CO_2 Reduction

Stalhed, J. L. and Odberg, J. A. B., Soderfors, Sweden (assigned to Stora Kopparbergs Bergslags Akt. Sweden). REDUCTION OF CO_2-CONTAINING GASES. U.S. 2,607,667 (1952) August 19.

A method is described of producing a reducing gas from CO_2 natural gas by reaction with a long vertical column of electrically heated carbonaceous material, preferably coke. Sulphur removal is obtained by using sponge iron, lime slurry, or limestone in the coke bed.
W. G. Bair

Coke Oven Operations

Hopton, G. U. CHEMICAL ENGINEERING PROGRESS IN THE GAS INDUSTRY. PART II. STORAGE, UTILIZATION AND BY-PRODUCTS. *Chem. Process Eng.* (British), 33, 301-304 (1952) June.

This is the second in a series dealing with chemical engineering applications in the British gas industry. Storage and utilization are discussed from a design point of view. By-products recovery from coke-oven gas are also discussed.
W. G. Bair

ST. LOUIS COKE OVENS. *Coke and Gas* (British) **14**, 303-310 (1952) September.

The new battery of 40 Simon-Carves compound underjet coke ovens produced its first coke on April 22, 1952, for the Great Lakes Carbon Corp. at St. Louis, Mo. It is the first battery of British design and construction in the United States and was built of imported materials in less than a year. It replaces the old 8-oven Belgian battery and utilizes the coal and coke handling system of the remaining 56-oven Koppers battery. The ovens are 20-1/2 inches average width, 13.25 tons capacity and carbonize 530 tons/day on 24-hour (foundry) coking time. They are heated by coke-oven gas on the hairpin flue principle; producer gas heating can be readily installed later. New gas mains, door machinery and by-product equipment were installed. O. P. Brysch

Distribution Problems

Foster, R. H. THE PRINCIPLES OF GAS DISTRIBUTION. *Gas World* (British), **86**, 162-165 (1952) July 19.

The essential problems of a gas distribution system are discussed, including maintenance of adequate pressures throughout the system, selection of feeder-main sizes and gas holders, load characteristics, preparation of trench bottoms, purging and general safety precautions.
R. A. Brown

Myhill, A. R. NAPHTHALENE TROUBLES. *Gas Times* (British), 72, 226-233 (1952) August 22.

The origin of difficulties in gas transmission due to deposition of naphthalene in the pipeline is reviewed. Suggested solutions of this problem include controlling coal carbonizing conditions, removal of naphthalene from the distribution system by means of solvent injection. References to methods of determining naphthalene in gas are given. C. E. Hummel

Partridge, F. M. GAS REGULATION AND NOISE CONTROL. *Instruments*, 25, 913-914 (1952) July: *Gas Age*, 110, 25-28 (1952) September 25.

Underground location of regulators and use of "Fiberglas" insulation reduces the noise level so that gas-control stations possibly may be used in residential areas. B. G. Lang

Frozen Coal

Abbott, T. S. CAR SHAKERS FOR UNLOADING FROZEN COAL. *Mining Eng.*, 4, 871-872 (1952) September.

A rotary car dump is considered by the author to be the preferred means of unloading large quantities of frozen coal, its use being limited however by the large cost of the equipment. The use of car shakers, which are considerably cheaper is the next most desirable means. If the car is frozen solid car shakers cannot be used, and thawing equipment is necessary. Car shakers can be used successfully only if the car is not frozen for more than 2 ft. all around. E. J. Pyrcioch

Curfman, R. E. UNLOADING FROZEN COAL WITH OIL TORCHES. *Mining Eng.*, 4, 873-874 (1952) September.

The use of oil torches in unloading a frozen coal car is effective but can be dangerous if precautions are not taken, and is relatively costly. The average cost per ton in addition to the normal dumping costs is about 9-3/4 cents. E. J. Pyrcioch

Dickinson, W. E. FREEZE PROOFING COAL WITH CALCIUM CHLORIDE. *Mining Eng.*, 4, 872-873 (1952) September.

Treatment of coal with calcium chloride prior to shipment will permit unloading of coal even though there may be some frozen lumps. The surface moisture of the coal determines whether a flake or solution treatment is to be used. It is claimed that the cost is low, no deposit is left and its use presents no fire hazard. E. J. Pyrcioch

FOUR SOLUTIONS TO COLD WEATHER UNLOADING. *Mining Eng.*, 4, 870-871 (1952) September.

This article, one of four on the problems of unloading frozen coal from hopper cars describes a mechanical car unloader. A ram with a sharp spade end is driven down into the frozen coal with a force of 20,000 lb. until a pocket is opened and the coal starts to run. A car shaker must be used following this operation to eliminate final clearing by hand. E. J. Pyrcioch

Gas Producer Levellers

Burke, S. A. and Sparham, G. A. REVIEW NO. 117: LEVELLER BARS AND AGITATORS FOR GAS PRODUCERS. *Brit. Coal Utilis. Research Assoc. Monthly Bull.* 16, 349-366 (1952) August.

The principles of leveller bars and agitators, as applied to mechanized gas producers are reviewed. Three main groups are outlined: (a) horizontal bars rotating in a fixed bed, or fixed in a revolving bed (b) vertical bars which oscillate in a rotating bed (c) vertical pokers for piercing either type of bed. Applications of these to modern producers, and their operating performance are discussed. O. P. Brysch

Fluidized Carbonizer

Martin, H. Z. (assigned to Standard Oil Development Co.) APPARATUS FOR TREATING CARBONACEOUS SOLIDS. U.S. 2,607,666 (1952) August 19.

The patent refers to a fluidized carbonization apparatus having special provision for heating by direct combustion of a portion of the carbonaceous solids which are recirculated internally through a perforated plate. C. von Fredersdorff

Low-N$_2$ Water Gas

Glover, C. B. (assigned to United Engineers and Constructors Inc. METHOD OF PRODUCING LOW NITROGEN CONTENT GAS. U.S. 2,606,827 (1952) August 12.

The invention relates to the production of fuel gases of low nitrogen content by a simple modification of the cyclic water-gas process comprising the method of by-passing the high-nitrogen blast gases around the igniter near the end of the blast period and simultaneously steam purging the heat storage system without loss in cycle time. C. von Fredersdorff

Organic S Removal

Griffith, R. H. THE CATALYTIC OXIDATION OF ORGANIC SULPHUR COM-

POUNDS IN COAL GAS. *Gas World* (British), 136, 398-401 (1952) August 16: *Gas J.* (British) 271, 475-477, 481 (1952) August 27.

Commercial status and engineering data are given for this process. D. M. Mason

Oxide for Purifiers

Nahas, K. M. METHOD OF PRODUCING FERRIC HYDRATE FROM ANILINE SLUDGE. U.S. 2,608,468 (1952) August 26.

Hydrated iron oxide suitable for gas purification or pigment use is produced from low-grade ores or from sludge obtained in the reduction of nitrobenzene with iron, by digestion with sulfuric acid and an oxidizing agent. In an example the oxide showed a Kunberger activity of from 185 to 265 seconds and a capacity of from 35 to 50% by weight. D. M. Mason

Synthesis Gas

Kalbach, J. C. (assigned to Hydrocarbon Research, Inc.) CONVERSION OF CARBONACEOUS MATERIALS INTO A FUEL GAS. U.S. 2,609,283 (1952) September 2.

Conversion of carbonaceous material to a fuel gas is proposed by direct hydrogenation in a fluidized bed at 300 to 750 psi and 1000 to 1500° F., the hydrogen being furnished by the continuous gasification of the refuse carbonaceous material by steam and oxygen in a fluidized-bed reactor. C. von Fredersdorff

Tar Emulsions

Myhill, A. R. TAR AND EMULSION TROUBLES. *Coke and Gas* (British), 14, 289-292, 296 (1952) August.

A general review is given of causes of tar-water emulsion formation in carbureted water-gas production. H. R. Linden

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Krejci, J. C. SYNTHESIS GAS MANUFACTURE. p. 218

Schmidt, E. X. GAS MIXING CONTROL. p. 223

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Carbon Black

Friauf, G. F. (assigned to Godfrey L. Cabot, Inc.) FURNACE FOR PRODUCING CARBON BLACK. U.S. 2,606,819 (1952) August 12.

This invention relates to an improved burner construction for the production of carbon black of improved quality and yield.

J. D. Parent

Carrier Gas Line

UNIQUE GAS LINE. *Oil Gas J.*, 51, 166 (1952) September 22.

Gulf Interstate Gas Co. proposes to lay an 860-mile transmission line from Louisiana to West Virginia. The proposal is unique in that the line would be a carrier for the Columbia Gas System which would own the gas transported.

J. D. Parent

Catalytic Reforming

Riesz, C. H., Dirksen, H. A., Pleticka, W. J. IMPROVEMENT OF NICKEL CRACKING CATALYSTS. Institute of Gas Technology, Chicago, Research Bulletin 20, (1952) October.

The work described herein was directed toward further improvement in the already excellent performance of commercial nickel catalysts patterned after the Institute-developed use of nickel on alumina spheres. Systematic study was made of the component elements of the catalyst, the support and its porosity, the promoter and its concentration, and the nickel concentration. These variables were first evaluated in screening tests based on the interaction of natural gas and steam at high feed rates, and then selected catalysts were more thoroughly investigated in pilot unit capacity tests.

A number of significant findings were disclosed in the course of the work. First, various thermally stable ceramics were found to be suitable supports for the dispersion of nickel in active form. Periclase (fused magnesium oxide), and alumina (fused aluminum oxide), were particularly effective.

Second, addition of small amounts (1.0-1.5%) of magnesium oxide or aluminum oxide as promoters greatly enhanced the activity of stable, but relatively low-activity catalysts. Many other compounds were tested, but none approached the relatively large promoting effects of magnesia or alumina.

Third, in a study of periclase supports with porosities ranging from 24 to 52%, activity was found to depend primarily on the quantity of deposited nickel per unit of catalyst volume. Above a value of 4 lbs of nickel per CF of catalyst, additional nickel impregnation had no further effect under the test conditions employed (1720-1740°F, 3000 CF/CF cat-hr space velocity). The lower density, higher porosity supports required a higher weight fraction of nickel at maximum effectiveness. However, the actual weight requirements of catalyst decreased with increasing porosity, in spite of the increasing weight fraction of nickel necessary to maintain a constant amount of nickel per CF catalyst volume.

The data from the pilot unit tests confirmed in a limited way the general nature of the laboratory conclusions and also the limitations in supplying, in a continuous process, the large quantities of heat necessary to effect high rates of conversion. Need for improved process equipment design in continuous tube type cracking plants, to utilize the higher potential gas-generating capacity of the improved catalysts, is indicated. And with these new improved catalysts the use of higher molecular weight hydrocarbons in the cyclic catalytic reforming process will be permissible and advantageous.

Authors' Abstract

Drilling Technology

Barnes, K. B. FACTS AND FIGURES OF THE DRILLING INDUSTRY. *Oil Gas J.*, **51**, 162-167 (1952) September 29.

Drilling costs are presented. A variety of items such as costs of rigs, operating costs, number of wells drilled by rotary and cable rigs, and footages are given for the past seven years.

J. D. Parent

Louden, E. W. ROTARY DRILLING FLUIDS — YESTERDAY, TODAY, AND TOMORROW? *Oil Gas J.*, **51**, 246-258 (1952) September 29.

This is an excellent introductory article on drilling fluids used in rotary drilling. The history of many of the commonly used additions, their function, and control are discussed.

O. T. Bloomer

McNeill, J. M. (assigned to Union Oil Co.) OFF-SHORE DRILLING. U.S. 2,606,003 (1952) August 5.

This invention relates to drilling in deep water (150 to 400 feet deep). A barge is to be anchored to the ocean floor and fitted with a fluid-type conductor tube extending to the ocean floor. The tubing would have flexible and extensible joints and would contain the drilling tools.

J. D. Parent

Ragland, D. (assigned to Standard Oil Development Co.) DRILLING FLUID FOR USE IN WELL-BORING OPERATIONS. U.S. 2,607,730 (1952) August 19.

It is claimed a mixture of alkali metal hydroxide, canaigre root and clay admixed with water to form a suspension, makes good drilling fluid. This suspension reduces the filtration rate as well as the viscosity.

D. C. Gami

DRILLING CONTRACT STANDARDIZED. *World Oil*, **135**, 146, 147 (1952) August.

Directors of the well drilling contractors association (AAODC) have adopted a uniform standardized contract.

J. D. Parent

Dust Problems

Keelan, J. P. CORRECTING DUST PROBLEMS AND JOINT LEAKAGE BY APPLICATION OF CARBOSEAL. *Gas Age*, **110**, 35, 36, 87-90 (1952) September 11.

With the increase in natural gas supply in the East, Harrisburg Gas Co. has been using a cyclic catalytic cracking furnace to supply a base-gas replacement for coke-oven gas. The dryness of the new gas brought up many problems of pilot outages, stopped services and clogged filters. To correct this condition, the

company planned and completed carboseal pouring to fix the dust. Complete planning and training methods are outlined for this task.

D. L. Nicol

Gas Conditioning

Culbertson, L. and Connors, J. S. DESULFURIZATION AND DEHYDRATION OF NATURAL GAS. *Petroleum Eng.*, 24, D10-D20 (1952) September.

Chemical processes for hydrogen sulfide removal from natural gases are discussed. A detailed description and cost data are given for the aqueous amine process. Dehydrators employing the glycol process and those of the solid dessicant type are compared. Flow diagrams and cost data are included.

C. E. Hummel

Miller, A. J. (assigned to Phillips Petroleum Co.) COMBINATION HIGH AND LOW PRESSURE ABSORPTION PROCESS. U.S. 2,608,516 (1952) August 26.

This patent relates to an improved oil absorption process for removing heavier hydrocarbons from natural gas available at low pressures, and is of special merit where only a part of the treated gas is passed to a high-pressure transmission line. Only a part of the gas is treated at high pressures, there being a high-pressure and a low-pressure absorber. By use of a special absorption column a part of the propane and heavier constituents of the low-pressure residue gas is transferred to the high-pressure residue gas without compressing the low-pressure gas.

O. T. Bloomer

Gas Dehydration

Campbell, J. M. and Laurence, L. L. DEHYDRATION OF NATURAL GAS AND LIGHT HYDROCARBON LIQUIDS. *Petroleum Refiner*, 31, 65-70 (1952) August.

This is the first of a series on the dehydration of natural gas and light liquid hydrocarbons. In this article the physical principles of the four basic methods of dehydration are explained. There is also an interesting discussion on gas hydrates and the means used to prevent their formation.

O. T. Bloomer

Culbertson, L. and Connors, J. S. HOW TO PREVENT FORMATION OF GAS HYDRATES. PART II. *Oil Gas J.*, 51, 114-116 (1952) August 18.

The principle of operation of the glycol absorption and the solid desiccant adsorption processes for removing water vapor from natural gas are briefly discussed. Cost data for 100 MMCF/day plants of both types are presented. These data show a total cost per MCF of 0.462 cents for the absorption process and 0.658 cents for the adsorption process. The adsorption process, however, can give more complete dehydration.

O. T. Bloomer

Gas Slip-Velocity

Stein, N., Elfrink, E. B., Wiener, L. D. and Sandberg, C. R. THE SLIP VELOCITY OF GASES RISING THROUGH LIQUID COLUMNS. *J. Petroleum Technology*, 4, 233-240 (1952) September.

This paper presents the results of a study of the slip velocity of gases rising through liquids in vertical tubes, inclined tubes, and vertical annuli. The data were obtained in gas-liquid systems which included combinations of air, propane and natural gas (over 97 per cent methane) with water, lubricating oils, and crude oils. The 214 data points obtained in this study along with 11 data points reported in the literature are incorporated in an empirical correlation which relates the mean slip velocity of gases flowing through liquids with the parameters gas rate, tube size, ratio of liquid viscosity to liquid density, gas density, liquid density, and the angle of the tube from the vertical. The average numerical deviation of the measured slip velocity data from values obtained from the correlation is 9.2 per cent. The average algebraic deviation between measured and predicted data is 0.31 per cent, an indication that the correlation is a satisfactory representation of the data. The correlation presented in this paper will be useful primarily in the design of subsurface gas-oil separation equipment for increasing the efficiency of oil-well pumping installations, but may perhaps be extended to other situations of gases rising through liquid columns. Authors' Abstract

H_2S Removal

Bechtold, I. C., Whittier, and Kohl, A. L. (assigned to The Fluor Corporation, Ltd.) EXTRACTION OF HIGH ACIDIC CONCENTRATIONS FROM GASES. U.S. 2,607,657 (1952) August 19.

Processes using diethanolamine solution for removing from 35 to 95% of hydrogen sulfide and/or carbon dioxide from gases are described.

D. M. Mason

Frazier, H. D., and Riesenfeld, F. C. (assigned to The Fluor Corp., Lt.) AMINE ABSORBENT GAS TREATING SYSTEM. U.S. 2,608,462 (1952) August 26.

Amines of low viscosity and having higher vapor pressures than monoethanolamine can be used in this process for hydrogen sulfide removal from gases, without significant loss of amine by vaporization or entrainment in the treated gas. Gas leaving the amine contactor is scrubbed with an amine solution which has been saturated with carbon dioxide. A low vapor-pressure carbonate is formed with the entrained amine and is subsequently regenerated in a still. Improved contact of gas with amine solution is thus made possible by utilization of low-viscosity amines.

C. E. Hummel

Frazier, H. D. (assigned to The Fluor Corp., Ltd.) PREVENTION OF AMINE LOSSES IN GAS TREATING SYSTEMS. U.S. 2,608,461 (1952) August 26.

Ethanolamine losses from hydrogen sulfide removal systems are reduced by the introduction of 0.001 to 0.1% of an acidic compound, preferably carbon dioxide, into the gas stream leaving the amine contactor. The carbonate derivative of the amine forms, having a relatively high molecular weight and low vapor pressure, and is recovered and subjected to regeneration treatment along with the amine absorbent.

C. E. Hummel

LP-Gas

FUEL SALES ON THE FARM. *Butane-Propane*, 14, 70-81 (1952) September.

The large potential farm market for LP-gases is discussed.

E. F. Searight

THE INDUSTRIAL MARKET. (PROPANE) *Butane-Propane*, 14, 82-103 (1952) September.

Propane is a safer, cleaner, and more economical fuel for various industrial applications. With this fuel temperatures as high as 3200°F. can be obtained. Potential and existing industrial markets in metal working, vitrifying, drying, railroad maintenance and food processing are discussed.

D. C. Gami

Natural Gasoline

Colby, D. S. and Seeley, E. M. NATURAL-GASOLINE AND CYCLE PLANTS IN THE UNITED STATES, JANUARY 1, 1952. U.S. Bureau of Mines Information Circular 7645 (1952) September.

This report lists the capacities and locations of the country's gasoline and cycling plants. The number of each type of plant (absorption, compression, cycling, etc.) in existence, and the nation-wide daily capacity is given for the period 1930-52.

J. D. Parent

Resen, F. L. ONE-MAN "PACKAGED" GASOLINE PLANT. *Oil Gas J.*, 51, 110-111 (1952) August 25.

This is a very interesting fully automatic skid-mounted gasoline plant processing only 12 MMCF per day of separator gas and producing 15,500 gal. of 18 RVP gasoline and 2,800 gal. of diesel fuel. It uses only one man and one shift per day, and employs elaborate safety features. The process equipment includes an absorber operating at 700 psi, rich oil and distillate (separator liquid) flashtanks, a still operating at 90 psi, a reabsorber for vent gas, a distillate stripper and a raw gasoline stabilizer operating at 300 psi.

J. D. Parent

Riley, H. G. and Cole, C. M., Jr. WHEN DOES IT PAY TO CYCLE GAS-CONDENSATE RESERVOIRS? *Oil Gas J.*, 51, 101-107 (1952) September 22.

Cycling involves returning gas to the reservoir thereby making greater liquid recovery possible, but deferring income from gas sales. Availability of gas markets, price of gas and liquid,

investment and operating cost of cycling equipment, richness of the fluid and reservoir characteristics are important factors controlling the feasibility of cycling as opposed to direct production. Four cases are discussed and it is concluded that gas price is very important in that it affects the abandonment pressure under primary depletion, also, costs incurred by cycling are not justified unless the fluid is rich and retrograde losses would be considerable.

J. D. Parent

Odorization

Hutchison, R. M. MORE ABOUT ODORIZATION OF NATURAL GAS. *Pipe Line News*, **24**, 15, 16 (1952) July.

An improved model of the combination (drip and absorption) type odorizer is described. The dripper is set to odorize the minimum flow of gas through the line to the desired level. An orifice in the main line causes a pressure differential at flows greater than this minimum flow; this differential actuates the by-pass absorption unit of the odorizer. For flows of 20 MCF per hour or less, a by-pass wick-type odorizer is recommended.

C. E. Hummel

ODOR-INTENSITY METER. *Am. Gas J.*, **177**, 35-36 (1952) September.

Measured volumes of odorized gas are mixed with a constant volume of air by the odorometer for odor intensity determination by "sniff tests". The instrument is now in production and will be available from the Oronite Chemical Co. C. E. Hummel

TOWER OXIDIZES ODORS AWAY. *Chem. Eng.*, **59**, 232-235 (1952) September.

Volatile, odorous sulfur compounds in spent pulping liquors are oxidized by air in a packed tower to form more stable thiosulfates. The retention of sulfur compounds has resulted in alleviating an odor problem, and in saving 1000 tons of sulfur per year. C. E. Hummel

Pipe Line Spans

Reynolds, P. E. ANALYSIS AND DESIGN OF PIPE-LINE SPANS. *Oil Gas J.*, **51**, 106-113, 134-136 (1952) August 8; *Gas*, **28**, 102-111 (1952) August.

Procedure for designing pipe-line spans is discussed. It is concluded that larger spans can be designed by selecting heavier pipes or selecting better quality pipes. D. C. Gami

Reserve Estimates

Katz, D. L., Turner, C. E., Grimm, R. D., Elenbaas, J. R. and Vary, J. A. SAMPLE GRADING METHOD OF ESTIMATING GAS RESERVES. *J. Petroleum Technology*, **4**, 207-212 (1952) August.

A technique is presented by which well samples and core plugs of dolomite formations are classified by microscopic examination into seven different porosity grades. Quantitative values of porosity and permeability are determined for each grade by a statistical correlation of the core-plug test data with the porosity grading system. These quantitative values are applied directly to the grades exhibited in the well samples for the purpose of estimating the reservoir void space for wells that were not cored. The procedure is described for estimating the gas reserves per unit area for the South Hugoton gas field, but a reserve estimate for the field is not given. It is not purported that this technique gives sufficiently accurate results to supplant core data but provides a reliable basis for augmenting and extending the use of such data over greater areas of the reservoir and to other similar reservoirs.

Authors' Abstract

Safe Pressures

Havenstein, P. W. SAFEGUARDING LOW PRESSURE SYSTEMS AGAINST EXCESSIVE PRESSURE. *Gas*, **28**, 48-52 (1952) August.

Various methods are described of safeguarding low-pressure distribution systems which are supplied with gas from sources of higher pressures, against pressures in excess of safe operating levels. R. A. Brown

Underground Storage

Cloud, C. E. UNDERGROUND STORAGE OF NATURAL GAS. *Pipe Line News*, **24**, 29-32 (1952) September.

This article presents a discussion of nine fac-

tors pertinent to the development and operation of underground gas storage fields. The operation of the underground storage fields of the Oklahoma Natural Gas Company's system is briefly outlined. O. T. Bloomer

Todd, R. OPERATION OF LA GOLETA GAS STORAGE FIELD. *Petroleum Eng.*, **24**, D45-D54 (1952) September.

The article presents a rather complete history of the La Goleta gas storage field operated by the Pacific Gas Lighting Supply Co. The field had a daily deliverability of 35 MMCF/day and a working storage capacity of 14.4 billion cu.ft. O. T. Bloomer

LACLEDE DEVELOPING UNDERGROUND STORAGE FOR 20,000,000 CUBIC FEET. *Gas Age*, **110**, 31-32 (1952) August 14.

An area of 25,000 acres north of St. Louis is undergoing preliminary geological work to prove the feasibility of using the area for storage of 20 billion CF. of gas. The structure is an anticline in a porous sandstone rock which presumably contains water. O. T. Bloomer

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Canadian Oil

Roberts, D. L. TECHNICAL AND COMMERCIAL FACTORS ON TRANS-MOUNTAIN PIPE LINE. *Pipe Line News*, **24**, 23-28 (1952) July.

Problems of location, design and construction of the pipe line across Alberta and British Columbia are discussed. A 24-inch line with 3/8" pipe thickness is selected for the purpose. When completed this line will play an important role from the defense consideration besides supplying the necessary crude to California, Washington and Oregon. D. C. Gami

Catalytic Cracking

Sittig, M. CATALYTIC CRACKING TECHNIQUES IN REVIEW. *Petroleum Refiner*, **31**, 263-316 (1952) September.

Discussed in this extensive summary of the catalytic cracking process are the chemical and engineering fundamentals, operations and maintenance aspects of fixed-bed, moving-bed and fluidized catalytic cracking. Author's Abstract

Core Studies

Richardson, J. G., Kerver, J. K., Hafford, J. A. and Osoba, J. S. LABORATORY DETERMINATION OF RELATIVE PERMEABILITY. *J. Petroleum Techn.*, **4**, 187-196 (1952) August.

A detailed study of a number of methods of relative permeability measurement has been made in a search for the technique most suited to routine analysis of cores taken from reservoir rock. It has been found from tests run on the same samples of core material by a number of techniques that the Penn State, Hassler, Hafford, and dispersed feed techniques all yield results which are felt to be reliable. Conditions under which the faster single core dynamic technique may be used are described. Further work on the calculation of relative permeabilities to oil from data obtained by the gas drive method is needed before this latter rapid method can be utilized. Correlations between theoretical studies and experimental results have been obtained in studies of the boundary effect, pressure distribution in two-phase flow, and gas expansion effects. Previous conclusions that the effects of the outflow boundary could be made negligibly small have been substantiated. Results of experimentally determined oil and gas pressure distributions along a core sample during flow are presented. Further studies of the effects of rate of flow in the measurement of relative permeability-saturation relations have shown that results are independent of the rate of flow as long as the flow rate is below the point where inertial effects commence. An analysis of the effects of a severalfold expansion of gas along the flow path indicates that while saturation gradients are induced in the test sample, the errors caused by this phenomenon in relative permeability measurements are small. Authors' Abstract

Desulfurization

Hoog, H. (assigned to Shell Development Co.) PROCESS FOR REFINING CARBONACEOUS MATERIAL. U.S. 2,608,521 (1952) August 26.

A liquid-phase catalytic hydrogenation proc-

ess for desulfurizing hydrocarbon oils ranging from gasoline to heavy gas oils is described. A total manufacturing cost of 26.4 cents per barrel for 80% desulfurization of a typical gas oil containing 1.2% sulfur is estimated.

D. M. Mason

Meyer, P. (assigned to Anglo-Iranian Oil Company Limited) CATALYTIC DESULFURIZATION OF PETROLEUM HYDROCARBONS. U.S. 2,606,141 (1952) August 5.

Methods of combining the autofining process (whereby sulfur compounds are hydrogenated to hydrogen sulfide with hydrogen obtained by simultaneous dehydrogenation of naphthenes) with the primary distillation of a crude oil are described. D. M. Mason

Fischer-Tropsch Catalyst

Gall, D., Gibson, E. J. and Hall, C. C. THE DISTRIBUTION OF ALCOHOLS IN THE PRODUCTS OF THE FISCHER-TROPSCH SYNTHESIS. *J. Appl. Chem.*, **2**, 371-380 (1952) July.

An alcohol-rich product obtained by Fischer-Tropsch synthesis at 160°-175° and 150 psi in the presence of a cobalt catalyst was examined. The proportion of acids and carbonyl compounds were lower than those reported for an iron-catalyst of the hydrocol type.

W. J. Pleticka

Gillespie, B. G. (assigned to Standard Oil Development Co.) CARBON-CONTAINING FISCHER-TROPSCH CATALYST AND ITS PREPARATION. U.S. 2,608,535 (1952) August 26.

An improved synthesis catalyst is claimed. The addition of carbon particles and an alkali-metal promoter to the iron oxide during catalyst preparation reduces induction time without a loss of catalyst activity or deterioration.

H. A. Dirksen

Hogan, J. P. and Friedman, A. H. (assigned to Phillips Petroleum Co.) REGENERATION OF CATALYST, U.S. 2,608,568 (1952) August 26.

An improved method of regenerating synthesis catalysts is presented. Specific advantages to be gained are (1) no gas other than synthesis gas is used (2) the pressure is automatically reduced without loss of time or synthesis gas. The catalyst is regenerated by passing the tail-gas from the reaction over the catalyst at normal operating temperature. H. A. Dirksen

Oil Cracking

Archibald, R. C., May, N. C. and Greensfelder, B. S. EXPERIMENTAL CATALYTIC AND THERMAL CRACKING AT HIGH TEMPERATURE AND HIGH SPACE VELOCITY. *Ind. Eng. Chem.*, **44**, 1811-1827 (1952) August.

The decrease of coke formation on the catalyst at constant conversion is shown to continue up to 675° C. both for pure hydrocarbons and for a West Texas gas oil. W. J. Pleticka

Keith, P. C. (assigned to Hydrocarbon Research, Inc.) CATALYTIC CONVERSION OF HYDROCARBONS IN THE PRESENCE OF REGENERATION GASES. U.S. 2,606,-862 (1952) August 12.

A process for the continuous conversion of a hydrocarbon feed stock in a fixed bed catalyst chamber is described. The chamber is divided into two sections which can be alternately regenerated so that continuous production can be obtained. A feature of the process is the use of high-purity O_2 and steam for regeneration. The regeneration process produces H_2 which is in time used to decrease carbon laydown in the reaction section of the vessel. Typical operating conditions: Pressure 200-800 psi, reaction temperature 850-950° F., regeneration temperatures 1600° F.-2500° F. Partial pressure of H_2 75-200 psi, partial pressure of reactant hydrocarbon 40-90 psi. This process is claimed to be most effective on heavy gas oil and crude. W. G. Bair

Leffer, F. W. (assigned to Universal Oil Products Co.) FLUIDIZED CONVERSION AND COKING OF HEAVY PETROLEUMS. U.S. 2,606,144 (1952) August 5.

In a process for fluidized cracking of heavy petroleum to coke and lower boiling products, the finer catalyst particles are separated in a segregation zone superimposed above the coking zone and returned in dense phase by a central conduit to the base of the coking zone for recirculation where they join the charge stream. The coarser particles pass downward through

an annular drying space surrounding the coking zone, and are withdrawn from the base.

O. P. Brysch

Naphtha Composition

Cady, W. E., Marschner, R. F. and Cropper, W. P. COMPOSITION OF VIRGIN, THERMAL AND CATALYTIC NAPHTHAS FROM MID-CONTINENT PETROLEUM. *Ind. Eng. Chem.*, 44, 1859-1864 (1952) August.

Virgin naphthas are analyzed with considerable ease in comparison with thermally and catalytically cracked naphthas, which contain a greater number and more complicated assortment of hydrocarbons. These three types of naphthas are compared according to hydrocarbon class, hydrocarbon structure, and the relation between the cracking of petroleum with the cracking of individual hydrocarbon. The free radical mechanism of thermal cracking and the carbonium-ion mechanism of catalytic cracking explain the difference in the products of these two types of naphthas. R. Parker

Oil Recovery

Kennedy, H. T. INCREASE OIL RECOVERY AND CUT STORAGE COSTS. *World Oil*, 135, 197-200 (1952) August.

The possibility of increasing the oil recovery from depleted gas-drained reservoirs by injecting liquified petroleum gases is discussed.

O. T. Bloomer

Processing Review

PETROLEUM REFINER 1952 PROCESS SECTION. *Petroleum Refiner*, 31, 97-259 (1952) September.

A concise description and flow diagram are given for 77 petroleum refinery processes in this latest annual review. These comprise 13 catalytic cracking, 6 thermal conversion, 3 light hydrocarbon recovery, 13 gas conversion, 2 oil distillation, 12 solvent refining, 20 treating and 11 petrochemical processes as licensed by 27 different companies. Processes or modifications published for the first time are SOD Model IV Fluid Catalytic Cracking, Hyperforming, HF Extraction, California Catalytic Polymerization, Electric Desaponification and Electric Distillate Treating. This is the industry's most complete handbook of processes since 1949.

O. P. Brysch

Synthetic Fuel Research

SYNTHETIC LIQUID FUELS. ANNUAL REPORT OF THE SECRETARY OF THE INTERIOR FOR 1951. PART I. OIL FROM COAL. U.S. Bureau of Mines Report of Investigations 4865 (1952) July.

During 1951 the demonstration Coal Hydrogenation plant at Louisiana, Mo. made one vapor-phase and two liquid-phase operating runs on W. Kentucky, Illinois No. 6 and Wyoming subbituminous coals, and the gas-synthesis plant made 2 runs and the products were tested. Bruceton and Pittsburgh laboratory and pilot plants continued studies on hydrogenation and Fischer-Tropsch catalysts, techniques and products. Morgantown, W. Va. reports results on a small and a large-scale pulverized-coal gasifying unit and initial tests of a high-pressure gasifier and sulfur-recovery purifier. Gorgas, Ala. completed the second underground gasification experiment of 22 months duration and began the third with adoption of the electro-linking process.

O. P. Brysch

SYNTHETIC LIQUID FUELS. ANNUAL REPORT OF THE SECRETARY OF THE INTERIOR FOR 1951. PART II. OIL FROM OIL SHALE. U.S. Bureau of Mines Report of Investigations 4866 (1952) July.

Research activities were curtailed in shale mining at Rifle, Colo. experimental shale mine, but 50,000 tons of shale were produced for the processing program. Shale reserves, and drilling techniques and costs were studied. The Shale Demonstration plant made operating studies on the 6 ton/day pilot retort and awarded a contract for erection of a 300 ton/day plant. Extensive research on nature and refining of shale oil, and cost studies on a 250,000 bbl/day operation were continued. At the Laramie, Wyo. Shale Experiment Station, laboratory-scale tests of a (1) inclined rotary retort (2) fluidized-bed retort and (3) entrained-solids retort led to the construction of the latter type on a pilot plant scale. Studies of improvement of shale oil refinery products, and research on composition of shale oil are continuing.

O. P. Brysch

Synthesis Gas

Corner, E. S., McGee, R. V., Lynch, C. S., Lewis, W. K., Jr. (assigned to Standard Oil Development Co. PRODUCTION OF INDUSTRIAL GASES CONTAINING CARBON MONOXIDE AND HYDROGEN, U.S. 2,607,668, 2,607,669, 2,607,670 (1952) August 19.

The production of carbon monoxide and hydrogen from a hydrocarbon gas passed over a fluidized metal oxide at 1400° to 1600° F is claimed. The metal oxides used singly or in mixtures are titanium, iron, chromium, nickel, manganese, tungsten and cobalt. The improvement claimed is that the loss of the metal by vaporization is avoided. H. A. Dirksen

Krejci, J. C. (assigned to Phillips Petroleum Co.) SYNTHESIS GAS MANUFACTURE. U.S. 2,605,174 (1952) July 29.

A two-step process is described, where oxygen and natural gas are burned to form some hydrogen and carbon monoxide which is then contacted with more natural gas and oxygen to form a synthesis gas at a selected temperature maintained by heat from the burning step.
H. A. Dirksen

Mayland, B. J. (assigned to Phillips Petroleum Co.) PRODUCTION OF HYDROCARBON SYNTHESIS GAS. U.S. 2,609,382 (1952) September 2.

A method of adjusting the hydrogen-carbon monoxide ratio by the use of a porous partition is claimed. W. J. Pleticka

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Plank, C. J. ACTIVITY OF CRACKING CATALYSTS. p. 218

7. ANALYTICAL METHODS AND TESTS

CO Analyzer

Serrill, J. L., Jr. NEW ANALYZER BREAKS BOTTLENECK IN F.C.C. OPERATION. *Oil Gas J.*, 51, 84-90 (1952) September 1.

An infrared type of carbon monoxide analyzer has been installed in the carbon burnoff phase of a catalytic cracker to increase the carbon burnoff rate without the danger of an afterburn. An increase in carbon monoxide in the lean-phase gas is indicated on the recorder, and the operation may immediately quench the system to lower the temperature to prevent the oxidation of carbon monoxide. S. Morf

Cracking Catalysts

Plank, C. J. ACTIVITY OF SILICA-ALUMINA CRACKING CATALYSTS A SIMPLE pH TEST. *Anal. Chem.* 24, 1304-1306 (1952) August.

An adsorption test involving the adsorption of ammonium ion from a standard ammonium acetate solution which is in equilibrium with a silica-alumina catalyst is reported, in which the pH gives a measure of the cracking activity of the catalyst. H. A. Dirksen

Fractionation Analysis

Miller, A. J. NGAA FRACTIONAL ANALYSIS PROGRAM. *Petroleum Eng.*, 24, C31-C36 (1952) August.

Two additional samples blended to known composition have been analyzed by the laboratories participating in the NGAA program on low temperature fractional distillation analysis. The mean deviation varied from 0.3 to 1.3 mol. percent, with the greatest deviation occurring on separation of isomers. Both improvement over earlier results and need for further improvement are demonstrated. D. M. Mason

Smith, I. M., Jr. DESIGN OF A COMPACT MANUAL LOW TEMPERATURE FRACTIONAL DISTILLATION UNIT. *Cal. Oil World*, 45, 2-6 (1952) August.

A unitized design for shop construction, using the CNGA column, is described.
D. M. Mason

Mass Spectrometer

Daigle, E. C. and Young, H. A. IMPROVED MACHINE METHOD FOR CALCULATION OF MASS SPECTROMETER ANALYSES. *Anal. Chem.*, 24, 1190-1197 (1952) July.

An improved calculating machine method is described which reduces a 24-component linear

simultaneous equation matrix in about two hours to a form suitable for repeated use with the same calibration coefficients. The reduced matrix can be used to evaluate a 24-component matrix in about 30 minutes. D. V. Kniebes

Hodes, M. J. ANALYSIS BY ATOMIC ARCHITECTURE — THE MASS SPECTROMETER. *Ind. Lab.*, 3, 72-77 (1952) September.

A popular description of the analytical mass spectrometer and the mass- spectrometer type leak detector is presented along with industrial applications of this type of instrument.
D. V. Kniebes

Moisture Determination

Cherry, G. W. and Haden, E. THE DETERMINATION OF WATER IN TAR FOG IN THE OUTLET GASES OF DETARRERS, USING FISCHER REAGENT. *Chem. and Ind.* (British) 780-781 (1952) August 9.

Water is distilled from the collected tar by entrainment with pyridine, and determined with Karl Fischer reagent, using the dead-stop end point. D. M. Mason

Frediani, H. A. AUTOMATIC KARL FISCHER TITRATION. *Anal. Chem.*, 24, 1126-1143, (1952) July.

A novel electrical apparatus has been developed which utilizes the dead-stop principle, automatically adds the reagent, and differentiates between "true" and "false" or fleeting end-points. No vacuum tubes are used. Greater precision is possible because of the automatic addition of reagent and electrical timing of the permanence of the end point. High precision is possible even with laboratorians unfamiliar with the Karl Fischer technique. Relatively complex samples may be titrated rapidly and the possible effect of side reactions is minimized.
Author's Abstract

Spectrochemical Methods

Hughes, R. C. APPLICATION OF POWDERED SAMPLES TO GRAPHITE ELECTRODES FOR SPECTROCHEMICAL ANALYSIS. *Anal. Chem.*, 24, 1406-1409 (1952) September.

A spectrochemical analysis for solid, insoluble, nonconducting materials is devised through powdering and dispersing them in glycerol for the excitation of an alternating current arc. The graphite electrodes are dipped in the dispersion; glycerol will be given off by heating and a thin coating of the sample will cover the electrodes surface, burning in a smooth and reproducible manner. An acceptable range of precision is claimed. S. Sensi

Sub-sieve Particles

Petersen, E. J., Walker, P. L. and Wright, C. C. MATHEMATICAL ANALYSIS OF SIZE-FREQUENCY DISTRIBUTIONS OF PARTICLES IN THE SUBSIEVE RANGE. *ASTM Bulletin* No. 183, 70-75 (1952) July.

Using microscopic size-frequency measurements a method is developed for determining surface area and weight distributions of particles in the subsieve range. The system does not require any assumption of a mean diameter for the size interval and allows the microscopic classification of particles into broader intervals than normally required. A plot of the size-frequency data in terms of the cumulative number N, of particles greater than a size X, versus X will give intermediate values of N for any value of X. Equation can be set up which may be integrated between the desired internal limits to determine the surface area or weight of that interval. Statistical analyses indicate an error of less than 12% for the method in the calculation of surface area. E. J. Pyrcioch

8. GENERAL AND PHYSICAL CHEMISTRY

Burning Velocities

Walker, P. L., Jr. and Wright, C. C. HYDROCARBON BURNING VELOCITIES PREDICTED BY THERMAL VERSUS DIFFUSIONAL MECHANISMS. *J. Am. Chem. Soc.*, 74, 3769-3771 (1952) August 5.

Some of the maximum burning velocity data for a number of hydrocarbons previously correlated by a diffusion theory are predicted by a thermal mechanism. E. F. Searight

Combustion Products

Littlejohn, R. F. and Whittingham, G. THE DECOMPOSITION OF SULPHURIC ACID

IN TOWN'S GAS FLAMES. *J. Chem. Soc.* (British) 3304-3308 (1952) August.

Dew-point measurements of the combustion products have been used to determine the degree of decomposition of sulphuric acid injected into premixed town's gas flames. The initial concentration of acid in the gases was in the range 0.006-0.12% (by vol.), and 94-98% is decomposed in Bunsen-type flames. Studies on separated flames show that the decomposition occurs almost entirely in the inner cone. The mechanism of decomposition is discussed with particular reference to the reaction between sulphur trioxide and atomic hydrogen.

Authors' Abstract

Electrical Breakdown

Allis, W. P. and Brown, S. C. HIGH FREQUENCY ELECTRICAL BREAKDOWN OF GASES. *Physical Rev.*, 87, 419-424 (1952) August 1.

Previous theoretical treatments of high frequency electrical breakdown in gases based on the Boltzmann transport equation were applied to specific gases and met with mathematical difficulties when applied to higher pressures. We now present a simpler solution applicable to any gas and to a wide pressure range. Agreement between theory and experiment with hydrogen gives confidence that the energy distribution function is correct and the distribution function is therefore used to compute other quantities of physical interest.

Authors' Abstract

Gas Separation

Berg, C. H. (assigned to Union Oil Co.) ADSORPTION PROCESS. U.S. 2,603,553 (1952) July 15.

This process for the separation of multicomponent gaseous mixtures employs two continuous selective absorption columns with moving beds of solid granular absorbents. Carbon dioxide is absorbed in the first bed of activated vegetable charcoal to approximately the same degree as ethane and ethylene. In the second step, hydrogen sulfide, propane, and propylene are absorbed in a similar manner. After desorption, the hydrocarbon and acidic constituents are separated by washing with alkanol amines or other alkaline reagents.

C. E. Hummel

Dickens, S. P., Coghlan, C. A. and Morrow, P. G. (assigned to The Texas Co.) SEPARATION OF GASES FROM MIXTURES THEREOF. U.S. 2,607,439 (1952) August 19.

A separation of mixed gases having different molecular weights is attained by ejecting a flowing stream of mixture as a jet across a gap at the extremity of a nozzle. The lighter component diffuses out at the gap. The invention is illustrated by drawings.

I. P. Patel

Methane Reactions

Gordon, A. S. THE REACTION BETWEEN METHANE AND STEAM IN THE TEMPERATURE REGION 1000° C. *Ind. Eng. Chem.*, 44, 1857-1864 (1952) August.

A study of the reaction of the decomposition of methane with steam at 1007 and 1033° C indicated the formation of ethane as a primary reaction and further dehydrogenation resulting in the formation of ethylene and acetylene also occurred. The pressure of acetylene was found to catalyze the primary reaction. A first-order reaction-rate-constant equation is also presented as a function of the methane decomposition and space velocity.

S. Mori

Nitrogen Properties

Bloomer, O. T. and Rao, K. N. THERMODYNAMIC PROPERTIES OF NITROGEN. Institute of Gas Technology Research Bulletin 18, Chicago, (1952) September.

The engineering design of plants to separate nitrogen from natural gas requires accurate data on the thermodynamic properties of nitrogen over a wide range of conditions. Published charts either cover an inadequate range of pressure or suffer from scale modulus limitations.

To provide charts of value to the natural gas industry, the usual thermodynamic properties of nitrogen have been recalculated on the basis of more recent fundamental data from the published literature. The properties are presented in tabular form and as charts of enthalpy vs. entropy, and of compressibility factor as a function of temperature and pressure. The range of the tables and charts is from saturated liquid at −320.4° F to superheated vapor at 500° F, and pressures from 10 to 1500 psia.

Properties tabulated are specific volume, enthalpy, entropy, and the fugacity-to-pressure ratio. For the superheated vapor region, calculations were based on zero-pressure specific heat data and a new equation of state.

O. T. Bloomer

Spectrometry

Humphreys, C. J. and Kostkowski, H. J. INFRARED SPECTRA OF NOBLE GASES (12000 to 19000 A). *J. Research, (N.B.S.)* **49**, 73-84 (1952) August.

The first spectra of helium, neon, argon, krypton, and xenon were obtained in the 12000 to 19000 A region. New wavelength values and some new lines were reported and classified.

D. V. Kniebes

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Campbell, J. M. DEHYDRATION OF NATURAL GAS. p. 212

Riesz, C. H. IMPROVEMENT OF NICKEL CRACKING CATALYSTS. p. 210

9. ORGANIC CHEMISTRY

Amine Manufacture

Resen, F. L. JEFFERSON CHEMICAL CO., PORT NECHES, TEX. *Oil Gas J.*, **51**, 102-103, 138-141 (1952) August 25.

The steps from ethylene to mono, di- and triethanolamine, are presented. W. J. Pleticka

Ammonia Production

Gray, W. (assigned to Phillips Petroleum Co.) PRODUCTION OF AMMONIA. U.S. 2,610,-106 (1952) September 9.

Hydrocarbons and hydrogen in tail gas from ammonia synthesis are burned with air and the resulting nitrogen is recycled. D. M. Mason

Resen, F. L. PETROCHEM REPORT: LION CHEMICAL CO., EL DORADO, ARK. NEW AMMONIA PLANT, TO BE ERECTED NEAR NEW ORLEANS, IS IN EARLY PLANNING STAGE. *Oil Gas J.*, **51**, 96-97, 137 (1952) August 18.

Lion's El Dorado plant for production of anhydrous ammonia, nitric acid, ammonium nitrate, ammonium sulfate, and sulfuric acid from natural gas, sulfur, air and water is described. D. M. Mason

CS_2 Removal

Mapstone, G. E. and Chodkiewicz, W. J. ALKALI EXTRACTION OF CARBON DISULPHIDE FROM BENZOLE. *J. Appl. Chem.* (British) **2**, 435-438 (1952) August.

The extraction of carbon disulphide from its solution in benzene by means of sodium hydroxide solution is a first-order reaction with respect to the carbon disulphide content, and appears to be diffusion-controlled ($E = 3.43$ kcal.). The rate of extraction is a function of the extent of mixing, the sodium hydroxide concentration, and temperature; the rate may be increased appreciably by the addition of a wetting agent and/or glycol, sucrose or molasses. At 71° C. about 90% of the CS_2 was extracted in 60 minutes. For plant use higher temperature and pressure would be required to reduce the time of mixing. D. M. Mason

Diolefine Removal

Robinson, S. P. (assigned to Phillips Petroleum Co.) CONTINUOUS SEPARATION OF HYDROCARBONS WITH CUPROUS HALIDE ABSORBENTS. U.S. 2,606,938 (1952) August 12.

A fluidized-bed method of selectively absorbing diolefins from gases by reaction with cuprous halides, is described. D. M. Mason

10. CHEMICAL ENGINEERING

Fluidized Reactor

Goodson, L. B. and Guyer, J. A. (assigned to Phillips Petroleum Company) FLUID TYPE CATALYTIC REACTION CHAMBER AND METHOD OF OPERATING SAME. U.S. 2,606,097 (1952) August 5.

The invention claims an improved reactor design for vapor phase fluid catalytic processes. The features are a reaction zone and a settling zone contained within the large reaction ves-

sel. The inventors claim that by using 100-140 mesh catalyst and apparent vapor velocities of 0.2 ft/sec in the settling zone, none of the catalyst will be carried out of the vessel. The vessel can be used on any type of fluidized system at low or high pressures. W. G. Bair

Heat & Mass Transfer

Ingebo, R. D. VAPORIZATION RATES AND HEAT-TRANSFER COEFFICIENTS FOR PURE LIQUID DROPS. *Chem. Eng. Progress*, 43, 403-408 (1952) August.

This article presents an analytical solution for the absorption of a solute in a moving bed of solid, but porous spheres. The solution is based on the assumption of counter-current and rod-like flow of solids and gas. An illustrated problem is solved in order to show how to use the equations. The final results are presented graphically and algebraically. R. E. Peck

Kasten, P. R. and Amundson, N. R. ANALYTICAL SOLUTION FOR SIMPLE SYSTEMS IN MOVING-BED ADSORBERS. *Ind. Eng. Chem.*, 44, 1704-1711 (1952) July.

Heat transfer coefficients and rates of vaporization were obtained for nine pure liquid spheres in air. The results are presented as a correlation of the Nusselt number as a function of the Reynolds number, the Schmidt number and the conductivity ratio for the solute and solvent. Rates of evaporation are correlated as functions of the thermal conductivity of the air and vapor, temperature drop from sphere to air, latent heat, diameter of sphere and Reynolds and Schmidt numbers. R. E. Peck

Scrubber Design

Alcock, J. F., (England). SUBMERGED BLAST GAS SCRUBBER. U.S. 2,608,399 (1952) August 26.

The patent refers to a novel design for a submerged-blast gas scrubber having curved baffles arranged to provide rapid circulatory motion of the scrubbing water; permitting substantially a constant pressure drop with gas flow, and designed to prevent back-up of scrubbing water in the event of reversal of gas flow. C. von Fredersdorff

Ortgies, R. C. (assigned to Whiting Corp.) HORIZONTAL GAS SCRUBBER. U.S. 2,608,267 (1952) August 26.

A horizontal fan-driven gas scrubber is described for removing dust from air comprising essentially (a) tangential air inlet causing rotary motion around axial water-spray jets (b) inner multi-inlet cyclone having axial water-sprays, followed by a baffled disengaging space and (c) water clarification tank and continuous sludge-removal equipment. C. von Fredersdorff

Sulfur Recovery

Nevins, S. L. and Gilliam, J. S., Jr. (assigned to The Fluor Corp., Ltd.) RECOVERY OF ELEMENTAL SULFUR. U.S. 2,603,464 (1952) July 15.

An apparatus for condensing vapor-phase sulfur is described. The sulfur entrained in the reaction gases is removed by a countercurrent stream of liquid sulfur. C. E. Hummel

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Berg, C. H. ADSORPTION PROCESS. p. 220

PETROLEUM REFINER 1952 PROCESS SECTION, p. 217

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Analog Computors

Crumb, C. B., Jr. ENGINEERING USES OF ANALOG COMPUTING MACHINES. *Mech. Eng.*, 74, 635-639 (1952) August.

This paper points out how general-purpose analog computors fit into the over-all pattern of modern computing aids. Descriptions of these machines and how they work and the kinds of problems that justify automatic computor treatment are included. R. A. Brown

Dehumidifier

Asker, G. C. (assigned to Daly, Merritt and Sullivan, Inc.) AUTOMATIC GAS DRIER. U.S. 2,606,627 (1952) August 12.

This dehumidifier has its automatic valve, cycle timing and switching mechanisms combined for

a simplified operation by a single motor either for a single or duplex unit and for control of dry and wet air outlets or inlets or both whereby an economical and compact simplicity is effected. I. P. Patel

Gas Meters

Connor, W. F. HISTORY AND OPERATION OF POSITIVE DISPLACEMENT GAS METERS. *Instruments*, 25, 1279-1281 (1952) September.

A history and operation of dry-type positive displacement gas meters is given. E. F. Searight

High Temperature Furnace

Rendall, J. H. A HIGH TEMPERATURE SINTERING FURNACE. *J. Sci. Instruments* (British), 29, 248-250 (1952) August.

A high-temperature furnace where materials of dimensions less than 75 mm. length and 15 mm. diameter may be heated to as high as 2400° C. in on vacuum or hydrogen atmosphere is described. Advantage of this over using the specimen as a resistor in an electric current and thus putting enough kva evenness of temperature upon the whole specimen. S. Mori

LP-Gas Measurement

Perkins, D. C. TESTING LPG MEASURING DEVICES. *LP-Gas*, 12, 71-73, 124-125 (1952) August.

The equipment and procedures used by the State of California and the County of Los Angeles in testing LP-gas measuring devices are described. O. T. Bloomer

Mixing Control

Schmidt, E. X. and Warner, C. W. (assigned to Cutler-Hammer, Inc.) GAS MIXING CONTROL METHOD AND APPARATUS. U.S. 2,608,199 (1952) August 26.

A fully automatic peak-shaving gas control system is described. E. F. Searight

Pipe Line Cleaner

Blackman, G. R. and McWhorter, C. J. STRAINER FOR PIPE LINES AND MEANS FOR CLEANING THE SAME. U.S. 2,606,663 (1952) August 12.

A new strainer for cleaning pipe line without interrupting flow while cleaning the strainer is described. A cylindrical screen in the strainer collects all the deleterious matter, while a rotating brush cleans this screen and directs the accumulated matter to a lower storage tank. D. C. Gami

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Partridge, F. M. GAS REGULATION AND NOISE CONTROL. p. 209

ODOR INTENSITY METER. p. 214

12. MATERIALS OF CONSTRUCTION

Black Iron Substitutes

Myler, W. M., Jr. NOW WE HAVE THE ANSWER TO "BLACK IRON OR EQUIVALENT." *Gas*, 28, 45-47 (1952) August.

This article reviews research done on substitutes for black iron. It gives comparisons of rates of corrosion for a number of these substitutes. E. F. Searight

Cathodic Protection

McCamish, H. M. MAGNESIUM ANODE INSTALLATIONS IN THE GAS DISTRIBUTION SYSTEM. *Pipe Line News*, 24, 36-38 (1952) July.

The article discusses, in two installments, the galvanic corrosion problems that arose in a new service area following the installation of adjacent gas and water systems. The subsequent plan of cathodic protection by means of magnesium anode installation and its results are described. R. A. Brown

Reichard, E. C. CONTROL GALVANIC CORROSION. STOP COSTLY FAILURES. *Materials and Methods*, 36, 83-86 (1952) August.

Environment and the characteristics of metal are both important in determining the amount of galvanic corrosion. Various means of protecting construction materials from corrosion are described. They include use of sacrificial anodes, inhibitors and anodic and cathodic coatings. D. C. Gami

Corrosion

Hackerman, N. EFFECT OF TEMPERATURE ON CORROSION OF METALS BY WATER. *Ind. Eng. Chem.*, **44**, 1752-1755 (1952) August.

The effect of temperature on corrosion rates are still under study. The factors are the change in O_2 solubility, the solubilities of the corrosion products, difference in the diffusion rates and the particle size of the corrosion product. The overall corrosion rate is a function of all variables and is not defined in general but the specific case may be analyzed.

W. G. Bair

Corrosion Inhibitors

Breston, J. N. CORROSION CONTROL WITH ORGANIC INHIBITORS. *Ind. Eng. Chem.*, **44**, 1755-1761 (1952) August.

Organic inhibitors have been developed by recent research which will successfully control corrosion in acid environment, at high temperature, and with control of microbiological action. They are the only means of effective control in many cases. They are used extensively in the petroleum industry, acid cleaning solutions, refrigeration and power plant applications.

W. G. Bair

Ulmer, R. C. and Wood, J. W. INHIBITORS FOR ELIMINATING CORROSION IN STEAM AND CONDENSATE LINES. *Ind. Eng. Chem.*, **44**, 1761-1769 (1952) August.

Experimental tests were run to determine the effectiveness of two types of corrosion controlling methods in steam condensate systems. One method consisted of the addition of alkaline substances in solution to the system in order to raise the pH and neutralize the acidic constituents of the water. The second method consisted of adding film-forming substances to the water so that the metal was protected from the corrosive media. The effect of both of these treatments was observed on mild steel, copper and yellow brass. The acid neutralizers were found to give the best results. Film-forming materials were effective but to a lesser extent. If the system consists entirely of iron the pH adjusting method is best, a pH minimum of 8.2 being required. If copper and brass are present, the pH should be maintained in the range of 7.0 to 7.5 where the corrosion of copper and brass is low.

E. J. Pyrcioch

Plastic Uses

McCamly, F. C. LAMINATED THERMOSETTING PLASTICS. *Petroleum Eng.*, **24**, C43-C46 (1952) August.

The increasing importance of laminated thermosetting plastics as used in the oil and gas industries as component materials is discussed. The combination of mechanical, electrical and physical properties of these materials have produced such outstanding features as high mechanical strength, corrosion resistance, both electrolytic and chemical, and low moisture absorption.

R. A. Brown

Well Corrosion Control

Shock, D. A. and Sudbury, J. D. CORROSION CONTROL IN GAS-LIFT WELLS. *Corrosion*, **8**, 296-299 (1952) September.

Severe corrosion was found to be taking place in the South Texas oil wells where producing pressures were not abnormally high. Most of these wells were produced by gas lift. An investigation was instigated to study the causes of the corrosion and find some means of bringing it under control. An Otis type "F" tubing stop was developed to hold a specially designed coupon so that the corrosion rates could be checked at various levels in the tubing. The studies indicated that the rates of corrosion followed the general corrosive criteria set up for condensate wells when the pressure conditions at given depths and temperatures and CO_2 contents were considered. The top-hole coupons did not reflect the actual severity of corrosion which could be taking place down the hole in the same manner as they do in condensate wells. It was also found that in these gas-lift wells a considerable height of water column was present in the annular space, and any successful inhibition method had to be so designed that the inhibitor would mix in the water and diffuse through it to fall to the bottom. Oil-soluble and emulsifiable inhibitors were therefore found to be unsatisfactory, because they were blown through the gas-lift valves and never reached the bottom of the tubing. General factors governing corrosion mitigation problems in these oil wells are discussed.

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LP-Gas

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